CLAIMS

1. In a network including a server and a plurality of clients, a method for achieving simultaneous media playout, the method comprising:

from a server, supplying a media stream to clients at a first bitrate (R1);

determining the network delivery requirement; and,

in response to the network delivery requirements, modifying the supply of the media stream.

2. The method of claim 1 wherein determining the network delivery requirements includes determining the buffering capacities of the clients, and determining media streaming disruptions.

3. The method of claim 2 wherein determining the buffering capacities of the clients includes determining the first minimum client buffering capacity (C1).

4. The method of claim 3 wherein determining the first minimum client buffering capacity (C1) includes:

polling the clients for their respective buffering capacities;

determining which client has the smallest buffering capacity; and,

selecting the first minimum buffering capacity (C1) to be equal to the client with the smallest buffering capacity.

5. The method of claim 4 further comprising:

at each client, scheduling the playout to be at a time equal to a first time interval (t1) plus the minimum buffering capacity divided by the first bitrate (C1/R1).

6. The method of claim 5 further comprising:

prior to supplying a media stream at the first bitrate (R1), communicating the first minimum buffering capacity (C1) to the clients.

7. The method of claim 6 further comprising:

following the supplying of media stream at a first bitrate (R1), changing clients in the network;

determining the new minimum client buffering capacity (Cnew); and,

wherein modifying the supply of the media stream includes modifying the supply of the media stream in response to the new minimum buffering capacity (Cnew).

8. The method of claim 7 wherein modifying the supply of the media stream includes temporarily pausing the supply of the media stream at the first bitrate (R1), and temporarily increasing the media stream bitrate.

9. The method of claim 8 further comprising:

prior to modifying the supply of the media stream, communicating the new minimum buffering capacity (Cnew) to the clients.

10. The method of claim 9 wherein temporarily pausing the supply of the media stream at the first bitrate (R1) includes temporarily pausing the supply of the media stream if the new minimum buffering capacity (Cnew) is less than the first minimum buffering capacity (C1).

11. The method of claim 10 wherein temporarily pausing the supply of the media stream, if the new minimum buffering capacity is less than the first minimum buffering capacity, includes pausing for a time equal to the first minimum buffering capacity minus the new minimum buffering capacity, divided by the first bitrate ((C1 – Cnew)/R1).

12. The method of claim 8 wherein determining the new minimum buffering capacity includes:

determining if the new minimum buffering capacity (Cnew) is greater than the first minimum buffering capacity (C1);

determining if the supply of the media stream has been disrupted; and,

wherein modifying the supply of the media stream includes temporarily increasing the media stream bitrate.

13. The method of claim 12 further comprising:

polling the clients and the server to determine the minimum bitrate (Rmin); and,

wherein modifying the supply of the media stream includes supplying the media stream at the minimum bitrate (Rmin) for a time equal to the new minimum buffering capacity minus the first minimum buffering capacity, divided by the minimum bitrate minus the first bitrate ((Cnew – C1)/(Rmin – R1).

14. The method of claim 8 wherein supplying a media stream from a server to clients at a first bitrate (R1) includes supplying data as media packets;

wherein determining the new minimum buffering capacity includes:

determining the current_buffer_level (Cc), which is the number of media packets buffered at each client;

determining if the new minimum buffering capacity is less than the current buffer level; and,

wherein modifying the supply of the media stream includes temporarily pausing the supply of media stream for a time equal to the current_buffer_level minus the new minimum buffering capacity, divided by the first bitrate ((Cc – Cnew)/R1).

15. The method of claim 14 further comprising:

polling the clients and the server to determine the minimum bitrate (Rmin); and,

wherein modifying the supply of the media stream includes supplying the media stream at the minimum bitrate (Rmin) for a time equal to the new minimum buffering capacity minus the current_buffer_level, divided by the minimum bitrate minus the first bitrate ((Cnew – Cc)/(Rmin – R1).

16. The method of claim 15 wherein determining the current_buffer_level includes determining if the media stream has been disrupted; and,

wherein modifying the supply of the media stream includes supplying the media stream at the minimum bitrate (Rmin) for a time equal to new minimum buffering capacity minus the current_buffer_level, divided by the minimum bitrate minus the first bitrate ((Cnew – Cc)/(Rmin – R1).

17. The method of claim 16 further comprising:

at the server, maintaining a current_buffer_level (Cc) measurement to track the number of media packets supplied by the server; and

at the server, maintaining a target_buffer-level measurement to track the new minimum client buffering capacity (Cnew); and,

wherein modifying the supply of the media stream includes modifying the supply of the media stream in response to the current_buffer_level and target_buffer_level measurements.

18. The method of claim 8 further comprising:

from the server, communicating the media stream modifications to the clients using real-time-streaming protocol (RTSP).

19. The method of claim 5 wherein supplying a media stream from a server to clients at a first bitrate (R1) includes supplying data as media packets with a timestamp;

wherein scheduling the playout to be at a time equal to a first time interval (t1) plus the minimum buffering capacity divided by the first bitrate (C1/R1) includes:

at each client, reordering out-of-order media packets;

at each client, handling any lost media packets; and,

at each client, scheduling the playout of the media packets at a uniform rate in response to the media type and the first bitrate (R1).

20. A system for achieving simultaneous media playout in a network, the system comprising:

a server having a network connection port to supply a media stream at a first bitrate (R1), the server determining network delivery requirements and, in response, modifying the supply of the media stream; and,

at least one client having a network connection port to receive the media stream and to transmit buffering capacities to the server.

21. The system of claim 20 wherein the server determines the network delivery requirements in response to determining the buffering capacities of the clients, and in response to determining media streaming disruptions.

22. The system of claim 21 wherein the server determines the first minimum client buffering capacity (C1).

23. The system of claim 22 wherein the server polls the clients for their respective buffering capacities;

wherein each client transmits their buffering capacity to the server in response to the poll; and,

wherein the server determines the first minimum buffering capacity (C1) to be equal to the client with the smallest buffering capacity.

24. The system of claim 23 wherein each client scheduling the playout to be at a time equal to a first time interval (t1) plus the minimum buffering capacity divided by the first bitrate (C1/R1).

25. The system of claim 24 wherein the server, prior to supplying a media stream at the first bitrate (R1), communicates the first minimum buffering capacity (C1) to the clients.

26. The system of claim 25 further comprising:

a change in the number of client, following the supplying of media stream at a first bitrate (R1); and,

wherein the server determines the new minimum client buffering capacity (Cnew), in response to the change in the number of clients, and modifies the supply of media stream in response to the new minimum buffering capacity (Cnew).

27. The system of claim 26 wherein the server modifies the supply of the media stream by temporarily pausing the supply of the media stream at the first bitrate (R1), and temporarily increasing the media stream bitrate.

28. The system of claim 27 wherein the server, prior to modifying the supply of the media stream, communicates the new minimum buffering capacity (Cnew) to the clients.

29. The system of claim 28 wherein the server temporarily pauses the supply of the media stream if the new minimum buffering capacity (Cnew) is less than the first minimum buffering capacity (C1).

30. The system of claim 29 wherein the server temporarily pauses the supply of the media stream by pausing for a time equal to the first minimum buffering capacity minus the new

minimum buffering capacity, divided by the first bitrate ((C1 – Cnew)/R1).

31. The system of claim 27 wherein the server temporarily increases the media stream bitrate as follows:

if the new minimum buffering capacity (Cnew) is greater than the first minimum buffering capacity (C1); and,

if the server determines that the supply of the media stream has been disrupted.

32. The system of claim 31 wherein the server temporarily increases the media stream bitrate if the new minimum buffering capacity is greater than the first minimum buffering capacity, by polling the clients and itself to determine the minimum bitrate (Rmin), and supplying the media stream at the minimum bitrate (Rmin) for a time equal to the new minimum buffering capacity minus the first minimum buffering capacity, divided by the minimum bitrate minus the first bitrate ((Cnew – C1)/(Rmin – R1).

33. The system of claim 27 wherein the server supplies media stream data as media packets;

wherein the server determines the current_buffer_level (Cc), which is the number of media packets buffered at each client, and if the new minimum buffering capacity is less than the current_buffer_level, the server temporarily pauses the supply of media stream for a time equal to the current_buffer_level minus the

new minimum buffering capacity, divided by the first bitrate ((Cc – Cnew)/R1).

34. The system of claim 33 wherein the server, if the new minimum buffering capacity is greater than the current buffer level, polls the clients and itself to determine the minimum bitrate (Rmin), and supplies the media stream at the minimum bitrate (Rmin) for a time equal to the new minimum buffering capacity minus the current_buffer_level, divided by the minimum bitrate minus the first bitrate ((Cnew – Cc)/(Rmin – R1).

35. The system of claim 34 wherein the server temporarily increases the media stream bitrate, if it has been determined that the media stream has been disrupted, by polling the clients and itself to determine the minimum bitrate (Rmin), and supplying the media stream at the minimum bitrate (Rmin) for a time equal to new minimum buffering capacity minus the current buffering capacity, divided by the minimum bitrate minus the first bitrate ((Cnew – Cc)/(Rmin – R1).

36. The system of claim 35 wherein the server includes a tracker to maintain a current_buffer_level measurement of the number of media packets being supplied by the server and a target_buffer_level measurement of the new minimum client buffering capacity; and,

wherein the server modifies the supply of the media stream in response to the current_buffer_level and target_buffer_level measurements maintained by the tracker.

37. The system of claim 27 wherein the server communicates media stream modifications to the clients using real-time-streaming protocol (RTSP).

38. The system of claim 20 wherein the server supplies media stream data as media packets with a timestamp; and,

wherein each client reorders out-of-order media packets, handles any lost media packets, and schedules the playout of the media packets at a uniform rate in response to the media type and the first bitrate (R1).